

CLAIMS

1. A method of drying material comprising the steps of:

5 evacuating air in a vacuum chamber containing said material
under an atmospheric pressure to a predefined pressure; and

 supplying air to said vacuum chamber to return the pressure in
said chamber to the atmospheric pressure,

10 wherein said evacuating and supplying steps are performed at
least once.

2. The method of drying material according to claim 1, wherein
said predefined pressure is decreased each time said evacuating step is
performed.

15 3. The method of drying material according to claim 1 further
comprising the steps of:

 supplying hot air into said chamber when said chamber is
returned to the atmospheric pressure; and

20 evacuating said chamber while said hot air is supplied to said
vacuum chamber;

 stopping the supply of said hot air after a predetermined time
duration; and

 evacuating said chamber to said predefined pressure.

25 4. The method of drying material according to claim 3, wherein
said predetermined time duration is at least one second.

30 5. The method of drying material according to claim 1, wherein
said steps are performed while heating said material in said vacuum
chamber.

6. The method of drying material according to claim 3, wherein the air pressure of said hot air supplied is lower than the air pressure in a previous evacuating step in one of a evacuating step performed thereafter.

7. The method of drying material according to claim 3, wherein a temperature of said hot air is at least 35 °C.

8. The method of drying material according to claim 1, wherein said supplying of air to said vacuum chamber is performed from a plurality of points.

9. The method of drying material according to claim 1, wherein said evacuating of said vacuum chamber is performed from a plurality of points.

10. The method of drying material according to claim 1, wherein said air to be supplied is dry air.

11. The method of drying material according to claim 10, wherein said dry air is passed through at least one of an air cleaner and a dehumidifier.

12. The method of drying material according to claim 1, wherein said predefined pressure is at most 200 Pa.

13. The method of drying material according to claim 5, wherein said material is heated using radiation heat from a heater.

14. The method of drying material according to claim 5, wherein said material is heated using dielectric heating by microwaves.

5 15. A dryer comprising a material container of a sealable structure, said container having an air outlet and an air inlet, said air outlet and air inlet are piped to an evacuator and an air supplier, respectively, and said container has a heating means.

10 16. The dryer according to claim 15, wherein said evacuator and said air supplier can operate repeatedly in one of a simultaneous manner and an alternating manner.

15 17. The dryer according to claim 15, wherein said air supplier has a means for heating air and a means for removing at least one of foreign substance and moisture from air.

18. The dryer according to claim 15, wherein said container has a plurality of air inlets.

20 19. The dryer according to claim 15, wherein said container has a plurality of air outlets.

25 20. The dryer according to claim 15, further comprising a means for removing at least one of foreign substance and moisture from air, said means for removing at least one of foreign substance and moisture from air being placed between said air outlet and said evacuator.

21. The dryer according to claim 15, wherein said heating means uses radiation heat from a heater.

22. The dryer according to claim 15, wherein said heating means uses dielectric heating by microwaves.

23. The dryer according to claim 15 further comprising the
5 following control means:

(1) means for actuating said heating means to heat a material in said container;

(2) means for actuating said evacuator, and stopping the evacuating operation after said container has reached to a first
10 predetermined vacuum pressure;

(3) means for actuating said air supplier to supply air to said container;

(4) means for actuating said evacuator to exhaust the air in said container;

(5) means for stopping said air supply operation after a
15 predetermined period of time; and

(6) means for stopping the evacuating operation after reaching to a second predetermined vacuum pressure.

20 24. The material dryer according to claim 23, wherein said second predetermined vacuum pressure can be set lower than said first predetermined vacuum pressure.

25 25. The dryer according to claim 23, wherein said first predetermined vacuum pressure is set lower each time said means for actuating said evacuation is operated during the drying process of a given material.

30 26. A method of manufacturing a circuit board comprising the steps of:

bonding a film shape material to at least one surface of a substrate material to form a board material with a film;

forming one of a through hole and a blind hole by irradiating said board material with a film with a laser;

5 cleaning said board material to remove at least one of altered parts and altered substances formed on an inner wall of one of said through hole and said blind hole, and to remove foreign substance adhering to a surface of said board material with a film;

10 blowing gas onto the surface of said board material with a film to remove water drops adhering to said surface;

drying moisture adhering to and absorbed in said board material with a film, using a method of drying; and

forming an electrical connection means in one of said through hole and said blind hole,

15 said method of drying comprising the steps of:

evacuating air in a vacuum chamber containing said board material under an atmospheric pressure to a predefined pressure; and

20 supplying air to said vacuum chamber to return the pressure in said chamber to the atmospheric pressure,

wherein said evacuating and supplying steps are performed at least once.

25 27. A method of manufacturing a circuit board comprising the steps of:

bonding a film-shape material to at least one surface of a substrate material to form a board material with a film;

30 forming one of a through hole and a blind hole by irradiating said board material with a film with a laser;

filling one of said through hole and said blind hole with conductive paste;

drying a double-sided circuit board having circuit patterns on both surfaces thereof, using a method of drying; and

5 laminating said double-sided circuit board and said board material to form a multi-layer circuit board, said board material being filled with said conductive paste and said film-shape materials on the both sides of said board material being peeled off,

said method of drying comprising the steps of:

10 evacuating air in a vacuum chamber containing said circuit board under an atmospheric pressure to a predefined pressure; and

supplying air to said vacuum chamber to return the pressure in said chamber to the atmospheric pressure,

15 wherein said evacuating and supplying steps are performed at least once.

28. A method of manufacturing a circuit board comprising the
20 steps of:

removing moisture from a circuit board having a circuit pattern on at least one surface thereof;

bonding a board material to at least one surface of said circuit board;

25 laminating said circuit board and said board material by further bonding a metal foil on said board material, and heating and pressing said circuit board and said board material at the same time; and

forming a means for electrically connecting said circuit board and said metal foil,

30 wherein moisture contained in said circuit board is removed using a method of drying,

said method of drying comprising the steps of:

evacuating air in a vacuum chamber containing said circuit board under an atmospheric pressure to a predefined pressure; and

5 supplying air to said vacuum chamber to return the pressure in said chamber to the atmospheric pressure,

wherein said evacuating and supplying steps are performed at least once.

10 29. The method of manufacturing a circuit board according to claim 26, wherein said substrate material comprises a prepregated material, said prepregated material being made by impregnating a reinforcing material with a thermosetting resin and making the resin
15 into B stage.

30. The method of manufacturing a circuit board according to claim 29, wherein said reinforcing material is one of a glass fiber fabric and a glass fiber non-woven fabric.

20 31. The method of manufacturing a circuit board according to claim 29, wherein said reinforcing material is one of an aromatic polyamide fiber fabric and an aromatic polyamide fiber non-woven fabric.

25 32. The method of manufacturing a circuit board according to claim 26, wherein said forming an electrical connection means is a method of filling said hole with paste containing conductive particles.

33. The method of manufacturing a circuit board according to claim 26, wherein forming an electrical connection means is a method of forming a plating layer on an inner wall of said hole.

5 34. The method of manufacturing a circuit board according to claim 26, wherein one of said board material and said circuit board is dried under a state of stacking sheets of one of said board material and said circuit board one on top of another.

10 35. The method of manufacturing a circuit board according to claim 26, wherein said film-shape material is coated with a thermosetting epoxy resin on a surface thereof.